



NOTES

TYPE I HYPERSENSITIVITY REACTIONS

GENERALLY, WHAT ARE THEY?

PATHOLOGY & CAUSES

- Exaggerated immune reaction mediated by IgE antibodies (atopy) triggered by harmless antigen (allergens)

Sensitization phase

- Allergen → antigen presenting cells (APCs) → B-cell, Th2 cells assist in IgE production → bind via Fc region to mast cells → mast cells sensitized

Re-exposure/effector phase

- Cytotropic/IgE receptor binding; allergens bind to Fab region of IgE on sensitized cells → activates mediator release
- Early phase reactions (within minutes)
 - Primarily mast cell-release of preformed mediators (e.g. histamine, proteases, chemotactants); causes vasodilation, capillary leak, increased secretions, bronchial smooth muscle contraction
- Late phase reactions (8–12 hours)
 - Mediators require synthesis (e.g. interleukins 4, 5, 10; leukotrienes); increases early downstream effects, prolongs inflammatory response

Common Type I hypersensitivity reactions

- Ingested allergens
 - Foods, dander, bee stings, mold, drugs/medications, pollen
- Other allergens
 - Latex, lotions, soaps, penicillin
- Atopic eczema
- Allergic urticaria
- Allergic rhinitis (Hay fever)
- Allergic asthma
- Anaphylaxis
- Eosinophilic esophagitis

CAUSES

- Causes of hyper/overactive re-exposure/effector phase unclear; environmental exposure (esp. in early childhood), genetic factors
- “Atopic march”: multiple atopic (IgE-mediated) diseases occur over lifetime

SIGNS & SYMPTOMS

- Range from mild, local (e.g. urticaria, rhinorrhea, itching) to life-threatening anaphylactic reaction (e.g. cardiac arrhythmia, shock, bronchospasm, laryngeal obstruction)

DIAGNOSIS

LAB RESULTS

- Skin allergen testing, variable sensitivities
- Eosinophilia

OTHER DIAGNOSTICS

- History of symptoms, frequency, triggers

TREATMENT

MEDICATIONS

- Symptom-based
 - Antihistamines (e.g. H1 blockers), corticosteroids, epinephrine

OTHER INTERVENTIONS

- Hypo/de-sensitization
 - Escalating doses of allergen subcutaneously injected over course of years; variable effectiveness, more severe reactions less responsive

VISIT...

LANZAROTE
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ACUTE RHINITIS

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PATHOLOGY & CAUSES

- IgE-mediated immune response upon re-exposure of airborne allergens to eyes, nose
- AKA hay fever
- Local mast cells of eye, nose mucosa degranulate, release immediate mediators (e.g. histamine)

CAUSES

- Hay, pollen (seasonal due to flowering plants), dust, animal hair, mold spores

SIGNS & SYMPTOMS

- Due to increased fluid in eyes, nasal cavity
 - Conjunctival injection, eyelid edema; sneezing; rhinorrhea, nasal obstruction; edematous bluish-red nasal turbinates

DIAGNOSIS

LAB RESULTS

- Skin allergen tests
 - Subdermal introduction of defined amount of allergen to volar surface of forearm; observe for “wheal-and-flare” reaction at specific site

OTHER DIAGNOSTICS

- Clinical presentation
 - History of symptoms, frequency, triggering events

TREATMENT

MEDICATIONS

- Oral antihistamine (e.g. H1 blockers)
- Nasal corticosteroids

OTHER INTERVENTIONS

- Nasal irrigation
- Environmental control (to avoid antigen)
- When severe, hypo/desensitization to allergen

ANAPHYLAXIS

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PATHOLOGY & CAUSES

- Generalized, life-threatening allergic response
- Systemic release of large quantities of immune mediators; symptoms most severe at site of greatest mediator concentration

Immune mediators

- **Histamine** (ubiquitous systemic concentration)
 - Vasodilator, immune system modulator
 - H1 receptor → tachycardia, pruritus, rhinorrhea, bronchospasm
 - H2 receptor → flushing, hypotension
- Tryptase (high skin concentration)
 - Activate complement, coagulation pathways, kallikrein–kinin systems
 - Angioedema, hypotension, disseminated intravascular coagulation (DIC)
- Leukotriene C4, prostaglandin D2 (in high lung concentration)
 - Bronchoconstriction, increased mucus secretion

CAUSES

- **Drugs** (e.g. beta-lactam antibiotics, insulin)
- **Foods** (e.g. nuts, eggs, seafood)
- **Proteins** (e.g. blood transfusions, tetanus antitoxin)
- **Latex**

SIGNS & SYMPTOMS

- Generalized, mild-moderate
 - Flushing, feeling of doom, tachycardia, urticaria, incontinence
- Generalized, severe
 - Syncope, shock, hypoxia, cardiorespiratory collapse

DIAGNOSIS

OTHER DIAGNOSTICS

- Clinical presentation
 - Symptoms indicate allergic reaction

TREATMENT

MEDICATIONS

- Immediate, necessary
 - Epinephrine intravenously (IV) (1:10,000)/intramuscularly (IM) (1:1,000), repeat every 30 minutes with potential epinephrine infusion after bolus(es)
- Adjunct therapy
 - H1, H2 receptor blockers, IV corticosteroids
- IV fluids, O₂ supplementation
- Critical care
 - Intubation, vasopressors if necessary

FOOD ALLERGY

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PATHOLOGY & CAUSES

- Adverse food reaction; **immune response to ingested antigens**
- Distinct from non-immunologic adverse food reactions
 - Enzyme deficiency (e.g. lactase), toxin ingestions (e.g. staphylococcal toxin), intolerance (e.g. caffeine)

TYPES

IgE-mediated

- Rapid onset (minutes to couple hours after ingestion); immune mediator release from tissue mast cells, circulating basophils; common allergens include peanuts, soy, milk, wheat, fish

Non-IgE mediated

- Symptoms subacute to chronic in nature; leukocytosis; local, lymphocytic destruction of gastrointestinal (GI) tissue; celiac disease, food protein-induced enterocolitis syndrome (FPIES)

Mixed IgE/non-IgE-mediated

- Variable immune response, acute responses involving IgE-mediation, others favoring leukocytes (e.g. eosinophils, lymphocytes); atopic dermatitis, eosinophilic esophagitis, eosinophilic gastroenteritis

SIGNS & SYMPTOMS

- Dermatologic (e.g. pruritus, erythema, urticaria), GI (e.g. nausea, vomiting, abdominal pain, diarrhea), anaphylactic (e.g. cardiac/respiratory reactions)
- Non-IgE-mediated food allergies
 - Nonspecific, subacute/chronic GI symptoms; distinct dermatologic vesicular, papular eruptions; dermatitis herpetiformis in celiac disease

DIAGNOSIS

LAB RESULTS

- **Skin allergen testing**

OTHER DIAGNOSTICS

- Food elimination trials

TREATMENT

MEDICATIONS

- Antihistamines
 - May be of little value unless urticaria, angioedema present

OTHER INTERVENTIONS

- Elimination of offending food from diet; mild disease may remit with time